

Our Ref: INA-26

Client's Ref: 4739-18-US

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

-----X

In re Application of: Peter Niebling, <i>et al.</i>	:	Examiner: Hammon, Thomas R.
Appln. No.: 10/569,837	:	Art Unit: 3656
Filed: May 19, 2006	:	Dated: February 5, 2009
Title: SEALING ARRANGEMENT	:	Confirmation No.: 3427

-----X

Points for Interview

CLAIM AMENDMENTS

1. (Currently Amended) A sealing arrangement which seals at least one radial interspace between an outer lateral surface of at least one inner bearing ring and an inner lateral surface of at least one outer bearing ring, the radial interspace being a hollow region bounded radially by the outer lateral surface of the outer bearing ring and by the inner lateral surface of the outer bearing ring between the bearings where the outer bearing ring and the inner bearing ring bearings do not mate, the sealing arrangement comprising

- at least a first support, the first support bearing having at least one elastic seal,
- second support, the second support bearing having at least one encoder arranged outside the interspace, and the encoder being oriented radially toward at least one sensor arranged above the encoder in the radially outward direction and outside of a sealing arrangement,
- a dirt deflector on the inner bearing ring, the dirt deflector and the first support being arranged such that they can be rotated relative to one another, and the seal butting at least against the dirt deflector,

wherein the encoder engages around the inner bearing ring, and in that the encoder is covered fully at least in the radial direction and at least partially in the axial direction by means of a covering element, the covering element being rotationally fixed on one of the bearing rings, and wherein neither the encoder nor the sensor penetrate into the interspace.

2. (Previously Presented) The sealing arrangement as claimed in claim 1, wherein the covering element at least partially covers the seal.

3. (Previously Presented) The sealing arrangement as claimed in claim 1, wherein the covering element is formed integrally with the first support made of sheet metal.

4. (Previously Presented) The sealing arrangement as claimed in claim 3, wherein the covering element is fixed on a radially outer surface section of the outer bearing ring.

5. (Previously Presented) The sealing arrangement as claimed in claim 3, wherein the covering element is fixed on an inner surface of the outer bearing ring.

6. (Previously Presented) The sealing arrangement as claimed in claim 4, wherein, starting from the outer bearing ring, the covering element first of all extends axially away from the outer bearing ring and radially between the sensor and the encoder, and covers the encoder in the radial direction in the process, in that the covering element then extends radially inward and covers the encoder and the interspace in the axial direction in the process, and in that the covering element, finally, extends axially in the direction of rolling bodies and accommodates the seal.

7. (Previously Presented) The sealing arrangement as claimed in claim 1, wherein the covering element is formed integrally with the second support.

8. (Previously Presented) The sealing arrangement as claimed in claim 1, wherein the dirt deflector and the second support are formed in one piece from sheet metal.

9. (Previously Presented) The sealing arrangement as claimed in claim 8, wherein, starting from the dirt deflector, and arranged radially between the seal and the inner bearing ring, the second support is first of all oriented axially in the direction of rolling bodies and then runs radially outward away from the inner bearing ring, between the rolling bodies and the seal, and in that the second support, finally, is oriented axially in the direction of the covering element and has the encoder.

10. (Previously Presented) The sealing arrangement as claimed in claim 1, wherein the dirt deflector and the covering element are formed in one piece.

11. (Previously Presented) The sealing arrangement as claimed in claim 10, wherein the covering element first of all is seated firmly on the inner bearing ring and then extends radially outward from the inner bearing ring, the covering element engaging partially around the outer bearing ring in the radially outward direction, it being spaced apart radially from the outer bearing ring.

12. (Previously Presented) The sealing arrangement as claimed in claim 10, wherein the encoder is arranged radially between the outer bearing ring and the covering element.

13. (Previously Presented) The sealing arrangement as claimed in claim 1, wherein the encoder is fixed on the outer bearing ring in the radially outward direction.

14. (Previously Presented) The sealing arrangement as claimed in claim 1, wherein the seal butts axially against the dirt deflector by way of at least one sealing lip.

15. (Previously Presented) The sealing arrangement as claimed in claim 1, wherein the seal butts radially against the dirt deflector by way of at least one sealing lip.

16. (Previously Presented) The sealing arrangement as claimed in claim 1, wherein the seal butts directly against the inner bearing ring by way of at least one sealing lip.

17. (Previously Presented) The sealing arrangement as claimed in claim 1, wherein the seal and the dirt deflector enclose between them an annular cavity filled with a lubricating grease.

Claim Status

Claims 1-17 are pending in this case.

Amendments

Claim 1 has been amended to define “radial interspace.” The definition can be found within the Specification paragraph 0008 of the published application.

Claim 1 has also been amended to define the sensor as external to the sealing arrangement. Best support for this limitation is in the drawing (see Fig. 8, for example).

Prior Art

1. Caillaut, *et al.* (U.S. Patent 5,239,124)

Caillaut, *et al.* teaches that the sensor (19) is arranged within the sealing arrangement. (See Caillaut, *et al.*, Figs. 2 and 3). Moreover, as noted in the Specification, the sensor in Caillaut is “made integral with at least the first end shield of the magnetic flux concentrating means and preferably arranged between the first and second end shields.” (See Caillaut, *et al.*, col. 2, lines 65-68). This stands in contrast to Applicants’ claimed approach, in which the sensor (14) is located outside the sealing arrangement. (See fig. 8). Additionally, the sensor in the claimed invention is fixed to the outer bearing ring independent of the sealing arrangement and other components associated with the design. (See third para. of Detailed Description of the Drawings). However, unlike the claimed invention, the sensor (19) in Caillaut is fixed within an encapsulation (20) composed of rigid plastic material. (See Caillaut, *et al.*, col. 4, lines 57-59). Thus, the claimed invention is distinguishable from Caillaut since the sensor is fixed outside the sealing arrangement and the sensor in Caillaut is fixed within the sealing arrangement.

2. Moretti, *et al.* (U.K. Patent 2 207 470 A)

Moretti, *et al.* shows a rather cramped arrangement, in which the sensor (22) is located within the sealing arrangement and the encoder is not positioned in the same configuration as the present invention. (See Fig. 2). As noted above, in the claimed approach, the sensor (14) is located outside the sealing arrangement. (See fig. 8). As this is not taught in the prior art, the claimed invention is distinguishable from Moretti.

3. Alff (U.S. Patent 5,640,087)

The encoder (10) of the present invention is protected from the environment by a covering element that fully covers it in both the radial and axial directions, and claim 1 highlights this aspect of the invention. As is clearly shown in Figure 7 of Alff, the encoder (17) is substantially exposed to the environment, unprotected by a cover. Even in Figure 6, where the encoder is somewhat within a sealing arrangement, the encoder is still not fully protected from the elements. Additionally, the encoder in Alff does not sit on a support in the same manner as the present invention when it is partially fixed internally. The encoder in Alff sits on an L-shaped bracket or seal in close proximity to the ball bearing below the outer bearing ring. However, the encoder in the present invention sits atop a support above the ball bearing parallel with the outer bearing ring. Furthermore, the encoder in Alff could not be positioned within a sealing arrangement similar to the present invention without extensive structural redesign and it does not appear it would even be possible due to space restrictions.

Additionally, although the sensor in Alff is located externally, the sensor must be in direct contact with the encoder (See Alff, Figs. 6 and 7), whereas the presently claimed

invention does not require direct contact between the sensor and encoder as the sensor is placed outside of the seal which surrounds the encoder. Thus, although the sensor in Alff is positioned externally, there is no sealing arrangement and the sensor must be in direct contact with the encoder and, therefore, the presently claimed invention is distinguishable from Alff.

4. Angelo, et al. (U.S. Patent 6,190,051)

Angelo does not show a sensor or teach an encoder that is radially displaced from the sensor. Instead, Angelo states: the encoder wheel (13) is a *radially* oriented annular *disc* made of plastic or rubber magnetized material with alternating polarities around the circumference and mounted adjacent to the axially inner side (10b) (that is to say towards the interior of the vehicle) of the radially outer rotating race (10). (Column 2, lines 9 – 15, italics added).

While the sensor is not shown in the figures, the clear interpretation of these words is that it is axially displaced from the encoder disc because that is how such “radially oriented” discs are employed in the art – across an axial gap.

Moreover, the encoder is positioned in parallel with the outer bearing ring and not within a similar orientation to the presently claimed invention.

5. Niki JP 2003-107484

Contrary to the presently claimed invention, the encoder (14) of Niki is axially open to the environment (see Figure 8), and thus open to dirt and other contamination that might degrade its performance in use. The presently claimed invention provides an encoder with full protection, which Niki does not.